

INITIAL REVIEW ENGINEERING REPORT  
PMN: 16-0400

Post-Focus Draft Revision 1 10/22/2018

ENGINEER: Prothero \ SL

PV (kg/yr): 63,500,000 Import Only YX

Revision Notes / Assessment Overview: IRER Rev 1 (10/22/18): Revised FOCUS IRER to update the post-FOCUS designation for testing shown in the SAT summary. No other changes.

SUBMITTER: Shell Chemical LP

USE: Solvent/diluent in coatings (25%), cleaning fluids (9.5%), agrochemicals (3.2%), and metalworking fluids/rolling oils (8.9%), and as a chemical intermediate (53.4%).

OTHER USES:

MSDS: Yes

Label: No

Gen Eqpt: where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739, AS/NZS:2161) made from the following materials may provide suitable protection: nitrile rubber gloves (longer term protection), PVC or neoprene rubber gloves (incidental contact / splash protection). For continuous contact, a breakthrough time of more [than] 240 minutes with preference for <480 minutes where suitable gloves can be identified. / Chemical splash goggles (chemical monogoggles) approved to EU standard EN166, AS/NZS:1337 / Chemical resistant gloves/gauntlets, boots, and apron. / Adequate explosion-proof ventilation to control airborne concentrations below the exposure guidelines/limits.

Respirator: If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker health, select respiratory protection equipment suitable for the specific conditions of use and meeting relevant legislation.

Health Effects: Repeated exposure may cause skin dryness or cracking. Harmful: may cause lung damage if swallowed.

TLV/PEL:

RCP Aliphatic dearom. solvents 200-250 100 % 1200 mg/m3 EU HSPA TWA (8 hr)

CRSS :

Chemical Name: Alkanes, C11-16-branched and linear

S-H20: 4E-06 g/L @

VP: 2.7E-1 torr @

MW: 156.00 %<500 %<1000

Physical State and Misc CRSS Info:

Neat: Liquid Mfg: NK - Imported Proc/Form: Solution, 70% PMN material in coatings or 5% in cleaning fluids or 45% in agrochemical formulation or 35% in metalworking fluid or used neat as a chem End Use: Solution or Destroyed. The structures drawn are representative. The number and positions of the branching are variable and unspecified. The PMN material consists of 60-85% (typical 76%) iso-paraffins and 15-40% (typical 24%) n-paraffins, with <10% (typical 0%) C10, <15% (4.7% typical) C11, 10-25% (22.1% typical) C12, 10-30% (typical 24.2%) C13, 15-30% (typical 28.2%) C14, 10-30% (typical 16%) C15, 2-15% (typical 4.6%) C16, and <5% (typical 0.1%) C17+. Submitted data: BP = 212.1 to 258.2 °C; VP = 0.15 torr (est.); insoluble in water; log P = 4.5-7; flash point = 70 °C, > 78 °C; auto ignition temp. = 200 °C, > 200 °C; 515 mg/kg aromatics (0.0515%, as determined by UV analysis); density = 0.764 at 15 °C; refractive index = 1.428; aniline point = 87 °C; viscosity = 2.4 mm2/s at 25 °C, 1.8 mm2/s at 40 °C; kinematic viscosity < 0.2 mm2/s at 25 °. IR, MS, UV/Vis, and 1H-NMR spectra are included with the PMN submission. Additional data on page 6.

Consumer Use: No

SAT (concerns) (06/17/2016):

Related Cases and Misc SAT Info:

Analogs: [REDACTED] [REDACTED] [REDACTED]

Migration to groundwater: Slow to moderate

PBT rating: P1-2B1-2T2

Health: 1-2 Dermal, Inhalation

Eco: 3 Water (All releases to water with a CC = 1 ppb)

OCCUPATIONAL EXPOSURE RATING: [REDACTED]

NOTES & KEY ASSUMPTIONS:

Generated by the 09/30/2013 version of ChemSTEER. FOCUS IRER notes: PMN import only -> MFG not assessed. // Same-submitter, similar use past case [REDACTED] was referenced for consistency. Several past cases were referenced to develop throughput, release, and exposure estimates. EPA referenced the following documents: Coatings: Formualtion and Application of UV/EB Curable Coatings, Inks, and Adhesives ESDs// Cleaning fluids: [REDACTED]  
[REDACTED] // Agrochemicals: [REDACTED]  
[REDACTED] // MW fluids: [REDACTED]  
(different submitter), [REDACTED] (different submitter), and Use of MW Fluids ESD // Chemical intermediate: [REDACTED] (same submitter, chemical intermediate). This IRER is generally consistent with past cases except that during USE 5: Chemical intermediate, this IRER assesses equipment cleaning per the March 2015 guidance, past cases do not assess equipment cleaning as they were completed prior to the 2015 guidance. // The submission states that a majority of shipping containers will be dedicated and not require regular cleaninig; if so, a majority of transport container residual release estimates presented below would be eliminated. // IRER Rev 1 (10/22/18): Revised FOCUS IRER to update the post-FOCUS designation for testing shown in the SAT summary (request per 10/22/18 email). No other changes.

POLLUTION PREVENTION CONSIDERATIONS:

P2 Claims: This PMN Submission is the subject of a P2 Assessment for participation in the Sustainable Futures Initiative. The P2 assessment of Hydrocarbons, C11-16, branched and linear, with CAS RN 1809170-78-2, referred to as SHL003 in the assessment, directly follows this cover letter. Additional model outputs and methods for all the P2 framework tools used in this assessment can be provided upon request. SHL003 is an inherently low hazard substance. Extensive testing of similar GTL Solvent mixtures has shown little to no human health effects for the substances. In addition, aquatic effects testing has shown that similar alkyl mixtures with alkyl ranges of C10 and greater show low acute and chronic effects to the aquatic environment. These results are collected in a summary reference below and attached to the PMN; they also cover previous PMNs, including P-14-132 to P-14-137, that showed for both human health and ecotoxicity concerns, EPA concurs that the hazard levels were low for alkyl ranges consisting of C10 or greater. Based on this, SHL003 is predicted to have a low human health cancer and non-cancer hazard concerns, as well as low aquatic toxicity hazard concerns. SHL003 is predicted to partition primarily to air and soil, where it will have a low concern for persistence, with an environmental half-life of <2 days in air and <60 days in all other media. The conclusion of the SHL003 aquatic risk assessment is that, based on low hazard, there is a low potential for risk to the aquatic environment. The conclusion of the SHL003 occupational and general population risk assessments is that, based on low hazard predicted for the substance, there is a low potential for risk to human health. It should be noted that this risk assessment does not take PPE and other exposure controls into account when determining exposure and risk. These factors would further reduce the potential for risk from this substance. It is our opinion that based on this assessment of the chemical and information included in the PMN submission and manufacturer's MSDS, including use of appropriate PPE and exposure controls, SHL003 will not pose an unreasonable risk to human health or the environment.

EXPOSURE-BASED REVIEW: Yes (3 criteria met)

1) # of workers exposed: 918,172 >1000? Yes

2) >100 workers with >10 mg/day inhalation exposure: Yes

3) (a) >100 workers w/1-10 mg/day inh. exp. & >100 days/yr: Yes

(b) Routine Dermal Cont: >250 workers & >100 days/yr: Yes

INITIAL REVIEW ENGINEERING REPORT

PMN: 16-0400

PROC: Transfer from import tankers to domestic transport containers

Number of Sites/ Location: 2

Boasso America Corp Channnelview TX

unknown site(s) Linden NJ

Days/yr: 250

Basis: Submission: 2 site, 100% PMN imported, and 250 exposure days/yr.  
CS calculates 127,000 kg PMN/site-bt.

Process Description: Imported PMN unloaded into feed tanks (liquid, 100%) --> Product is separated and stored in different product tanks (depending on final use) --> Product is transported via tank truck or rail car, or drums (liquid, 100%) (per submission)

ENVIRONMENTAL RELEASES ESTIMATE SUMMARY

IRER Note: The daily releases listed for any source below may coincide with daily releases from the other sources to the same medium.

Water or Incineration or Landfill

Conservative: 1.3E+3 kg/site-day over 1 day/yr from 2 sites

or 1.3E+3 kg/site-yr from 2 sites or 2.5E+3 kg/yr-all sites

to: uncertain

from: Equipment Cleaning Losses of Liquids from a Single, Large Vessel

basis: EPA/OPPT Single Vessel Residual Model, CEB standard 1% residual.  
Assume annual cleaning of tanks.

Air

Typical: 3.9E-1 kg/site-day over 250 days/yr from 2 sites

or 9.8E+1 kg/site-yr from 2 sites or 2.0E+2 kg/yr-all sites

Worst Case: 3.9E-1 kg/site-day over 250 days/yr from 2 sites

or 9.8E+1 kg/site-yr from 2 sites or 2.0E+2 kg/yr-all sites

to: air

from: Loading Liquid Product into Tank Trucks

basis: EPA/OAQPS AP-42 Loading Model.

RELEASE TOTAL

2.7E+3 kg/yr - all sites

OCCUPATIONAL EXPOSURES ESTIMATE SUMMARY

Tot. # of workers exposed via assessed routes: 6

Basis: The submission estimates up to 2 workers potentially exposed. EPA assumes a default minimum of 3 workers/site and that all workers perform all activities.

## Inhalation:

Exposure to Vapor (volatile) (Class II)

### Typical:

- > Potential Dose Rate: 1.9E+2 mg/day over 250 days/yr
- > Lifetime Average Daily Dose: 1.0E+0 mg/kg-day over 250 days/yr
- > Average Daily Dose: 1.8E+0 mg/day over 250 days/yr
- > Acute Potential Dose: 2.7E+0 mg/day over 250 days/yr

### Worst Case:

- > Potential Dose Rate: 5.6E+3 mg/day over 250 days/yr
- > Lifetime Average Daily Dose: 3.1E+1 mg/kg-day over 250 days/yr
- > Average Daily Dose: 5.5E+1 mg/day over 250 days/yr
- > Acute Potential Dose: 8.0E+1 mg/day over 250 days/yr

Number of workers (all sites) with inhalation exposure: 6

Basis: Loading Liquid Product into Tank Trucks; EPA/OPPT Mass Balance Model. Typical: Cm = 44.73996 mg/m<sup>3</sup>; ED = 3.35535 hr/day. Worst Case: Cm = 1,342.199 mg/m<sup>3</sup>; ED = 3.35535 hr/day.

NOTE: The respirator class is: II. Gas/vapor (all substances in the gas form).

## INHALATION MONITORING DATA REVIEW

- 1) Uncertainty (estimate based on model, regulatory limit, or data not specific to industry): Yes
  - 2)a) Exposure level > 1 mg/day? Yes
  - OR
  - b) Hazard Rating for health of 2 or greater? 1-2 No
- => Inhalation Monitoring Data Desired? **No**

## Dermal:

Exposure to Liquid at 100.00% concentration

### High End:

- > Potential Dose Rate: 2.2E+3 mg/day over 250 days/yr
- > Lifetime Average Daily Dose: 1.3E+1 mg/day over 250 days/yr
- > Average Daily Dose: 2.2E+1 mg/day over 250 days/yr
- > Acute Potential Dose: 3.2E+1 mg/day over 250 days/yr

Number of workers (all sites) with dermal exposure: 6

Basis: Loading Liquid Product into Tank Trucks; EPA/OPPT 2-Hand Dermal Contact with Liquids Model.



INITIAL REVIEW ENGINEERING REPORT

PMN: 16-0400

PROC 1: Formulation of Coatings, Inks, and Adhesives (25% of Total PV)

Number of Sites/ Location: 300

unknown site(s)

Days/yr: 250

Basis: The January 2010 Emission Scenario Document (ESD) on the Formulation of Radiation Curable Coatings, Inks, and Adhesives provides default values of 250 operating days/yr; 520 kg radiation curable product/site-batch; 100% PMN in raw material; and 70% in final product (see ESD for additional details). The submission estimates up to 300 sites, 250 days/yr and 70% PMN in product. EPA assumes 300 sites and 250 days/yr to maximize exposures. CS calculates 211.67 kg/site-bt.

Process Description: Coating components (liquid, 100%) --> Preheating (optional) --> Unloading from Tank Cars, Totes, or Drums --> Mixing Kettle --> Filter --> Packaging --> Coating Product Sold or Used on Site (liquid, 70% - default per ESD).

ENVIRONMENTAL RELEASES ESTIMATE SUMMARY

IRER Note: The daily releases listed for any source below may coincide with daily releases from the other sources to the same medium. Per the ESD for the Formulation of Radiation Curable Coatings, Inks, and Adhesives, product sampling wastes are expected to be released to water, incineration, or landfill; due to the lack of industry-specific data, this release is not estimated. It should be noted that EPA expects releases of the chemical from product sampling activities to be relatively low in comparison to the other sources of release in the formulation process. Additionally, EPA indicates the potential for filter waste releases from the radiation curable formulation process, yet there is currently no standard EPA methodology for quantifying the amount of release (see ESD for additional details).

Water or Incineration or Landfill

High End:  $6.4\text{E}+0$  kg/site-day over 250 days/yr from 300 sites  
or  $1.6\text{E}+3$  kg/site-yr from 300 sites or  $4.8\text{E}+5$  kg/yr-all sites

to: water, incineration, or landfill (per ESD)

from: Cleaning Liquid Residuals from Drums Used to Transport the Raw Material

basis: EPA/OPPT Drum Residual Model, CEB standard 3% residual. Per the ESD for the Formulation of Radiation Curable Coatings, Inks, and Adhesives, EPA recommends assuming a default transportation container size of 55-gallon drums; therefore, the EPA/OPPT Drum Residual Model may be used to estimate this release. Container cleaning may involve organic and water wash, which could be released to water, incineration, or landfill, per ESD.

Water or Incineration or Landfill

Conservative:  $2.1\text{E}+0$  kg/site-day over 250 days/yr from 300 sites

or  $5.3\text{E}+2$  kg/site-yr from 300 sites or  $1.6\text{E}+5$  kg/yr-all sites

to: uncertain (incineration or landfill per ESD if radiation curable type)

from: Equipment Cleaning Losses of Liquids from a Single, Large Vessel

basis: EPA/OPPT Single Vessel Residual Model, CEB standard 1% residual. Per the ESD on the Formulation of Radiation Curable Coatings, Inks, and Adhesives, EPA assumes that the amount of residual radiation curable chemical remaining in the process equipment may be estimated using the EPA/OPPT Single Process Vessel Residual Model.

Air

Output 2:  $1.0\text{E}-5$  kg/site-day over 250 days/yr from 300 sites

or  $2.6\text{E}-3$  kg/site-yr from 300 sites or  $7.7\text{E}-1$  kg/yr-all sites

to: Air (per ESD)

from: Cleaning Liquid Residuals from Drums Used to Transport the Raw Material

basis: EPA/OPPT Penetration Model. Per the ESD for the Formulation of Radiation Curable Coatings, Inks, and Adhesives, "if the chemical is volatile (e.g., the vapor pressure is  $> 0.001$  torr), it may volatilize and be emitted from the process while empty containers are being rinsed and cleaned"; EPA suggests using the EPA/OPPT Penetration Model for estimating releases to air from containers cleaned indoors.

Air

Typical:  $3.1\text{E}-4$  kg/site-day over 250 days/yr from 300 sites

or  $7.7\text{E}-2$  kg/site-yr from 300 sites or  $2.3\text{E}+1$  kg/yr-all sites

Worst Case:  $6.2\text{E}-4$  kg/site-day over 250 days/yr from 300 sites

or  $1.5\text{E}-1$  kg/site-yr from 300 sites or  $4.6\text{E}+1$  kg/yr-all sites

to: Air (per ESD)

from: Unloading Liquid Raw Material from Drums

basis: EPA/OAQPS AP-42 Loading Model. Per the ESD for the Formulation of Radiation Curable Coatings, Inks, and Adhesives, "if the chemical is volatile (e.g., the vapor pressure is  $> 0.001$  torr), releases to air may occur from the displacement of saturated air when the chemical is transferred"; EPA suggests using the EPA/OAQPS AP-42 Loading Model to estimate releases from transfer operations.

Air

Typical:  $7.0\text{E-}5$  kg/site-day over 250 days/yr from 300 sites

or  $1.7\text{E-}2$  kg/site-yr from 300 sites or  $5.2\text{E+}0$  kg/yr-all sites

Worst Case:  $5.6\text{E-}4$  kg/site-day over 250 days/yr from 300 sites

or  $1.4\text{E-}1$  kg/site-yr from 300 sites or  $4.2\text{E+}1$  kg/yr-all sites

to: Air (per ESD)

from: Vented Losses to Air During Process Operations

basis: EPA/OPPT Penetration Model. Per the ESD for the Formulation of Radiation Curable Coatings, Inks, and Adhesives, "if the chemical is volatile (e.g., the vapor pressure is  $> 0.001$  torr) at the operating temperature, chemicals may volatilize and be emitted from the process during mixing"; EPA suggests using the EPA/OPPT Penetration Model for estimating releases to air from open vessels and process vents.

Air

Typical:  $7.0\text{E-}5$  kg/site-day over 250 days/yr from 300 sites

or  $1.7\text{E-}2$  kg/site-yr from 300 sites or  $5.2\text{E+}0$  kg/yr-all sites

Worst Case:  $5.6\text{E-}4$  kg/site-day over 250 days/yr from 300 sites

or  $1.4\text{E-}1$  kg/site-yr from 300 sites or  $4.2\text{E+}1$  kg/yr-all sites

to: Air (per ESD)

from: Open Surface Losses to Air During Product Sampling

basis: EPA/OPPT Penetration Model. Per the ESD for the Formulation of Radiation Curable Coatings, Inks, and Adhesives, "if the chemical is volatile (e.g., the vapor pressure is  $> 0.001$  torr), it may volatilize and be emitted from the process during product QA/QC sampling activities"; EPA suggests using the EPA/OPPT Penetration Model to estimate releases to air from sampling activities performed indoors.

Air

Output 2:  $1.6\text{E-}2$  kg/site-day over 250 days/yr from 300 sites

or  $3.9\text{E+}0$  kg/site-yr from 300 sites or  $1.2\text{E+}3$  kg/yr-all sites

to: Air (per ESD)

from: Equipment Cleaning Losses of Liquids from a Single, Large Vessel

basis: EPA/OPPT Penetration Model. Per the ESD on Radiation Curable Coatings, Inks, and Adhesives, "if the chemical is volatile (e.g., the vapor pressure is > 0.001 torr) it may be released to the air during equipment cleaning"; therefore, EPA suggests using the EPA/OPPT Penetration Model to estimate releases to air as this operation is likely to occur indoors.

Air

Output 2: 2.5E-2 kg/site-day over 250 days/yr from 300 sites  
or 6.1E+0 kg/site-yr from 300 sites or 1.8E+3 kg/yr-all sites  
to: Air (per ESD)

from: Filter Media Changeout

basis: EPA/OPPT Penetration Model. Per the ESD for the Formulation of Radiation Curable Coatings, Inks, and Adhesives, "if the chemical is volatile (e.g., the vapor pressure is > 0.001 torr) it may be released to air"; therefore, EPA suggests using the EPA/OPPT Penetration Model to estimate releases of volatile chemicals during filter media change out as this operation is likely to occur indoors.

Air

Typical: 4.4E-4 kg/site-day over 250 days/yr from 300 sites  
or 1.1E-1 kg/site-yr from 300 sites or 3.3E+1 kg/yr-all sites  
Worst Case: 8.8E-4 kg/site-day over 250 days/yr from 300 sites  
or 2.2E-1 kg/site-yr from 300 sites or 6.6E+1 kg/yr-all sites  
to: Air (per ESD)

from: Loading Liquid Product into Drums

basis: EPA/OAQPS AP-42 Loading Model. Per the ESD for the Formulation of Radiation Curable Coatings, Inks, and Adhesives, "if the chemical is volatile (e.g., the vapor pressure is > 0.001 torr) at the operating temperature, chemicals may volatilize and be emitted during adhesive product transfer (e.g., filling drums) operations"; EPA suggests using the EPA/OAQPS AP-42 Loading Model to estimate releases for transfer operations.

RELEASE TOTAL

6.4E+5 kg/yr - all sites

#### OCCUPATIONAL EXPOSURES ESTIMATE SUMMARY

Tot. # of workers exposed via assessed routes: 11,700

Basis: The ESD on the Formulation of Radiation Curable Coatings, Inks, and Adhesives conservatively estimates exposure for up to 39 workers per site. It can be conservatively estimated that all workers are exposed during each activity.

## Inhalation:

Note that the ESD specifies inhalation exposures for all workers from the following activities: (1) Unloading Radiation Curable Components; (2) Cleaning Empty Radiation Curable Component Containers; (3) Sampling; (4) Equipment Cleaning; (5) Filter Media Change out; and (6) Radiation Curable Product Packaging. Since the exposure estimates are the same for all activities (EPA/OPPT Mass Balance Model), this scenario presents one exposure for all workers.

## Exposure to Vapor (volatile) (Class II)

### Typical:

- > Potential Dose Rate: 1.5E-1 mg/day over 250 days/yr
- > Lifetime Average Daily Dose: 8.2E-4 mg/kg-day over 250 days/yr
- > Average Daily Dose: 1.4E-3 mg/day over 250 days/yr
- > Acute Potential Dose: 2.1E-3 mg/day over 250 days/yr

### Worst Case:

- > Potential Dose Rate: 8.9E+0 mg/day over 250 days/yr
- > Lifetime Average Daily Dose: 4.9E-2 mg/kg-day over 250 days/yr
- > Average Daily Dose: 8.7E-2 mg/day over 250 days/yr
- > Acute Potential Dose: 1.3E-1 mg/day over 250 days/yr

Number of workers (all sites) with inhalation exposure: 11,700

Basis: Unloading Liquid Raw Material from Drums; EPA/OPPT Mass Balance Model. Typical: Cm = 2.3 mg/m<sup>3</sup>; Worst Case: Cm = 139 mg/m<sup>3</sup>; ED = 0.05 hr/day.

NOTE: The respirator class is: II. Gas/vapor (all substances in the gas form).

## INHALATION MONITORING DATA REVIEW

- 1) Uncertainty (estimate based on model, regulatory limit, or data not specific to industry): Yes
  - 2)a) Exposure level > 1 mg/day? Yes
  - OR
  - b) Hazard Rating for health of 2 or greater? 1-2 No
- => Inhalation Monitoring Data Desired? **No**

## Dermal:

Note that the ESD specifies dermal exposures from the following activities: (1) Unloading Liquid Radiation Curable Components; (2) Cleaning Empty Radiation Curable Component Containers; (3) Sampling; (4) Equipment Cleaning; (5) Filter Media Changeout; and (6) Radiation Curable Product Packaging. Since the exposure estimates are the same for all of the activities except sampling (EPA/OPPT 2-Hand Dermal Contact with Liquid Model), this scenario presents one exposure for all workers. The EPA/OPPT 1-Hand Dermal Contact with Liquid Model is suggested for use to estimate dermal exposure from sampling; this scenario does not present this exposure as the EPA/OPPT 2-Hand Dermal Contact with Liquid Model is more conservative and would encompass dermal exposure from this activity.

Exposure to Liquid at 100.00% concentration

High End:

- > Potential Dose Rate: 2.2E+3 mg/day over 250 days/yr
- > Lifetime Average Daily Dose: 1.3E+1 mg/day over 250 days/yr
- > Average Daily Dose: 2.2E+1 mg/day over 250 days/yr
- > Acute Potential Dose: 3.2E+1 mg/day over 250 days/yr

Number of workers (all sites) with dermal exposure: 11,700

Basis: Unloading Liquid Raw Material from Drums; EPA/OPPT 2-Hand Dermal Contact with Liquids Model.

# INITIAL REVIEW ENGINEERING REPORT

PMN: 16-0400

USE 1: Application of Coatings, Inks, and Adhesives (25% of Total PV)

Number of Sites/ Location: 300

unknown site(s)

Days/yr: 250

Basis: The October 2011 Emission Scenario Document (ESD) on the Application of Radiation Curable Coatings, Inks, and Adhesives via Spray, Vacuum, Roll and Curtain Coating, provides default values of 250 operating days/year; 548 kg coating/site-batch; and 70% PMN in coating, ink, or adhesive (default for unknown type of product - see ESD for additional details). The submission estimates up to 300 sites and 250 days/yr. The submission also indicates that 12.5% of the total PV is projected to be used in roll coating operations at up to 200 sites. Due to uncertainty at multiple sites not controlled by the submitter, EPA conservatively assumes the entire PV is spray applied. EPA assumes 300 sites and 250 days to maximize exposures. CS calculates 211.67 kg/yr.

Process Description: Coating, ink, or adhesive (liquid, 70% PMN) is unloaded from transport containers --> Dilute and Mix (optional) --> Product is transferred to the application reservoir --> Product is applied to substrate via Roll, Spray, Curtain, or Vacuum coating --> Curing (product incorporated on Substrate/Article) (per ESD).

## ENVIRONMENTAL RELEASES ESTIMATE SUMMARY

IRER Note: The daily releases listed for any source below may coincide with daily releases from the other sources to the same medium. Per the ESD for the Application of Radiation Curable Coatings, Inks, and Adhesives, raw material sampling wastes are expected to be released to water, incineration, or landfill; due to the lack of industry-specific data, this release is not estimated. It should be noted that EPA expects releases of the chemical from raw material sampling activities to be relatively low in comparison to the other sources of release in the application process. In addition to the process losses assessed below, volatile components also evaporate during the application process. Solvents and other volatile components that do not react will completely volatilize by the time that the coating, ink, or adhesive cures. EPA has not currently developed a standard approach or attempted to assess releases of volatile components during spray, vacuum, roll, or curtain coating applications.

Water or Incineration or Landfill

High End: 6.4E+0 kg/site-day over 250 days/yr from 300 sites  
or 1.6E+3 kg/site-yr from 300 sites or 4.8E+5 kg/yr-all sites

to: water, incineration, or landfill (per ESD)

from: Cleaning Liquid Residuals from Drums Used to Transport the Raw Material

basis: EPA/OPPT Drum Residual Model, CEB standard 3% residual. Per the ESD on the Application of Radiation Curable Coatings, Inks, and Adhesives, EPA recommends assuming a default transportation container size of 55-gallon drums; therefore, the EPA/OPPT Drum Residual Model may be used to estimate this release. Container cleaning may involve an organic and water wash, which could be released to water, incineration, or landfill, per ESD.

Water or Incineration or Landfill

What-If: 3.8E+0 kg/site-day over 250 days/yr from 200 sites

or 9.5E+2 kg/site-yr from 200 sites or 1.9E+5 kg/yr-all sites

to: uncertain (ESD); incineration or land may be more likely for solid waste portion of solvent-based coatings; air or incineration or land depending upon emission control or lack thereof

from: Roll Coating

basis: User-Defined Loss Rate Model. Radiation-curable Coating Application ESD est 98% efficiency of roll coating as default (2% loss). Subm est about 200 sites will roll coat using PMN-containing coating. Assume 90% overall loss assuming most will evaporate, then apply 2% loss with solid waste.

Air

Typical: 4.4E-4 kg/site-day over 250 days/yr from 300 sites

or 1.1E-1 kg/site-yr from 300 sites or 3.3E+1 kg/yr-all sites

Worst Case: 8.8E-4 kg/site-day over 250 days/yr from 300 sites

or 2.2E-1 kg/site-yr from 300 sites or 6.6E+1 kg/yr-all sites

to: Air (per ESD)

from: Unloading Liquid Raw Material from Drums

basis: EPA/OAQPS AP-42 Loading Model. Per the ESD on the Application of Radiation Curable Coatings, Inks, and Adhesives, "if the chemical is volatile (e.g., the vapor pressure is > 0.001 torr), releases to air may occur from the displacement of saturated air when the chemical is transferred"; EPA suggests using the EPA/OAQPS AP-42 Loading Model to estimate the releases from transfer operations.

Air

Output 2: 1.5E-5 kg/site-day over 250 days/yr from 300 sites

or 3.7E-3 kg/site-yr from 300 sites or 1.1E+0 kg/yr-all sites

to: Air (per ESD)



from: Cleaning Liquid Residuals from Drums Used to Transport the Raw Material

basis: EPA/OPPT Penetration Model. Per the ESD on the Application of Radiation Curable Coatings, Inks, and Adhesives, "if the chemical is volatile (e.g., vapor pressure is  $> 0.001$  torr), it may volatilize and be emitted from the process while empty containers are being rinsed and cleaned"; EPA suggests using the EPA/OPPT Penetration Model for estimating releases to air from containers cleaned indoors.

Air

Typical:  $7.0\text{E-}5$  kg/site-day over 250 days/yr from 300 sites  
or  $1.7\text{E-}2$  kg/site-yr from 300 sites or  $5.2\text{E+}0$  kg/yr-all sites  
Worst Case:  $5.6\text{E-}4$  kg/site-day over 250 days/yr from 300 sites  
or  $1.4\text{E-}1$  kg/site-yr from 300 sites or  $4.2\text{E+}1$  kg/yr-all sites  
to: Air (per ESD)

from: Open Surface Losses to Air During Raw material Sampling  
basis: EPA/OPPT Penetration Model. Per the ESD on the Application of Radiation Curable Coatings, Inks, and Adhesives, "if the chemical is volatile (e.g., the vapor pressure is  $> 0.001$  torr), it may volatilize and be emitted from the process during QA/QC sampling activities"; EPA suggests using the EPA/OPPT Penetration Model to estimate releases to air from sampling activities performed indoors.

Air

What-If:  $1.6\text{E+}1$  kg/site-day over 250 days/yr from 100 sites  
or  $4.0\text{E+}3$  kg/site-yr from 100 sites or  $4.0\text{E+}5$  kg/yr-all sites  
to: Air (10%), Incineration or Landfill (90%) (per ESD), but add air to incineration and landfill portion due to uncertainty

from: Spray Coating

basis: EPA/OPPT Automobile Refinish Coating Overspray Loss Model (non-volatiles). The submission indicates that 12.5% of the total PV is projected to be used in roll coating operations. Due to uncertainty at multiple sites not controlled by the submitter, EPA conservatively assumes some of the PV is spray applied (100 sites). Per the ESD on the Application of Radiation Curable Coatings, Inks, and Adhesives, the Spray Coating release model should be used if the application method and type of substrate are unknown; EPA suggests using the EPA/OPPT Automobile Refinish Coatings Overspray Loss Model to estimate releases from spray coating. Per the ESD, the user should assume the use of a conventional spray gun within a spray booth equipped with dry filter as default; this model assumes a spray booth efficiency of 90% and a solid removal efficiency of 100%. As conservative, EPA assumes the fraction of radiation curable product adhered is 25% (or a loss fraction of 75%) (per ESD). For this model, overspray releases are assessed to air (10%) and landfill or incineration (90%) (see ESD for additional details).

Air

Output 2: 1.5E-1 kg/site-day over 250 days/yr from 300 sites  
or 3.8E+1 kg/site-yr from 300 sites or 1.1E+4 kg/yr-all sites  
to: Air (per ESD)

from: Equipment Cleaning Losses of Liquids from Multiple Vessels  
basis: EPA/OPPT Mass Transfer Coefficient Model. Per the ESD on the Application of Radiation Curable Coatings, Inks, and Adhesives, "if the chemical is volatile (e.g., the vapor pressure is > 0.001 torr), it may be released to air"; EPA suggests using the EPA/OPPT Penetration Model for estimating releases to air from containers cleaned indoors.

Air or Incineration or Landfill

What-If: 1.4E+2 kg/site-day over 250 days/yr from 100 sites  
or 3.6E+4 kg/site-yr from 100 sites or 3.6E+6 kg/yr-all sites  
to: Air (10%), Incineration or Landfill (90%) (per ESD), but add air to incineration and landfill portion due to uncertainty

from: Spray Coating

basis: EPA/OPPT Automobile Refinish Coating Overspray Loss Model (non-volatiles). The submission indicates that 12.5% of the total PV is projected to be used in roll coating operations. Due to uncertainty at multiple sites not controlled by the submitter, EPA conservatively assumes some of the PV is spray applied (100 sites). Per the ESD on the Application of Radiation Curable Coatings, Inks, and Adhesives, the Spray Coating release model should be used if the application method and type of substrate are unknown; EPA suggests using the EPA/OPPT Automobile Refinish Coatings Overspray Loss Model to estimate releases from spray coating. Per the ESD, the user should assume the use of a conventional spray gun within a spray booth equipped with dry filter as default; this model assumes a spray booth efficiency of 90% and a solid removal efficiency of 100%. As conservative, EPA assumes the fraction of radiation curable product adhered is 25% (or a loss fraction of 75%) (per ESD). For this model, overspray releases are assessed to air (10%) and landfill or incineration (90%) (see ESD for additional details).

Air or Incineration or Landfill

What-If: 1.9E+2 kg/site-day over 250 days/yr from 200 sites  
or 4.7E+4 kg/site-yr from 200 sites or 9.3E+6 kg/yr-all sites  
to: uncertain (ESD); incineration or land may be more likely for solid waste portion of solvent-based coatings; air or incineration or land depending upon emission control or lack thereof

from: Roll Coating

basis: User-Defined Loss Rate Model. Radiation-curable Coating Application ESD est 98% efficiency of roll coating as default (2% loss). Subm est about 200 sites will roll coat using PMN-containing coating. Assume 90% overall loss assuming most will evaporate, then apply 2% loss with solid waste.

#### Incineration or Landfill

Conservative: 4.2E+0 kg/site-day over 250 days/yr from 300 sites  
or 1.1E+3 kg/site-yr from 300 sites or 3.2E+5 kg/yr-all sites  
to: Incineration or Landfill (per ESD)

from: Equipment Cleaning Losses of Liquids from Multiple Vessels  
basis: EPA/OPPT Multiple Process Vessel Residual Model, CEB standard 2% residual. Per the ESD on the Application of Radiation Curable Coatings, Inks, and Adhesives, industry-specific information estimates approximately one percent of used radiation curable product is lost during equipment cleaning at the application site with releases typically sent to incineration or land. EPA recommends using the EPA/OPPT Multiple Process Vessel Residual Model to conservatively estimate process losses from equipment cleaning if additional site-specific information is not available.

#### RELEASE TOTAL

1.4E+7 kg/yr - all sites

#### OCCUPATIONAL EXPOSURES ESTIMATE SUMMARY

Tot. # of workers exposed via assessed routes: 5,700

Basis: The ESD on the Application of Radiation Curable Coatings, Inks, and Adhesives conservatively estimates exposure for up to 19 workers (overall average) for unknown coatings, inks, and adhesives. It can be conservatively estimated that all workers are exposed during each activity.

## Inhalation:

Note that the ESD specifies inhalation exposures for all workers from the following activities: (1) Unloading Radiation Curable Formulation; (2) Raw Material Sampling; (3) Cleaning Empty Radiation Curable Component Containers; (4) Application of Radiation Curable Product; and (5) Equipment Cleaning. Inhalation exposure for all activities other than (4) are estimated using the EPA/OPPT Mass Balance Model. Inhalation exposure for activity (4) is estimated based on the application method chosen; the default method is Spray Coating and therefore the EPA/OPPT Automobile OEM Spray Coating Inhalation Model can be used to estimate exposure. Therefore, this scenario presents two inhalation exposure estimates for all workers. // Note: Inhalation exposures to chemical vapors during the application process presents a data gap; the PMN is a volatile liquid where the airborne concentration of the chemical of interest is unknown (see ESD for additional details).

### Exposure to Vapor (volatile) (Class II)

#### Typical:

- > Potential Dose Rate: 2.1E-1 mg/day over 250 days/yr
- > Lifetime Average Daily Dose: 1.2E-3 mg/kg-day over 250 days/yr
- > Average Daily Dose: 2.1E-3 mg/day over 250 days/yr
- > Acute Potential Dose: 3.0E-3 mg/day over 250 days/yr

#### Worst Case:

- > Potential Dose Rate: 1.3E+1 mg/day over 250 days/yr
- > Lifetime Average Daily Dose: 7.1E-2 mg/kg-day over 250 days/yr
- > Average Daily Dose: 1.2E-1 mg/day over 250 days/yr
- > Acute Potential Dose: 1.8E-1 mg/day over 250 days/yr

Number of workers (all sites) with inhalation exposure: 300

Basis: Unloading Liquid Raw Material from Drums; EPA/OPPT Mass Balance Model.

NOTE: The respirator class is: II. Gas/vapor (all substances in the gas form).

### INHALATION MONITORING DATA REVIEW

- 1) Uncertainty (estimate based on model, regulatory limit, or data not specific to industry): Yes
  - 2)a) Exposure level > 1 mg/day? Yes
  - OR
  - b) Hazard Rating for health of 2 or greater? 1-2 No
- => Inhalation Monitoring Data Desired? **No**

### Exposure to Mist (volatile) (Class III)

#### What-If:

- > Potential Dose Rate: 2.3E+1 mg/day over 250 days/yr
- > Lifetime Average Daily Dose: 1.3E-1 mg/kg-day over 250 days/yr
- > Average Daily Dose: 2.3E-1 mg/day over 250 days/yr
- > Acute Potential Dose: 3.3E-1 mg/day over 250 days/yr

Number of workers (all sites) with inhalation exposure: 1,900

Basis: Spray Coating; EPA/OPPT Automobile OEM Spray Coating Inhalation Model (non-volatile non-polyisocyanates). Per the ESD on the Application of Radiation Curable Coatings, Inks, and Adhesives, spray application in the radiation curable products industry is typically a controlled process conducted in a spray booth or an enclosed system. EPA recommends that if the process enclosure is unknown, assume the default system to be a manual or unenclosed application. Exposure estimates for an unknown process enclosure are conservatively estimated using the EPA/OPPT Automobile OEM Spray Coating Inhalation Exposure Model. /// Note: Inhalation exposure from spray application should be assessed for both volatile and non-volatile chemicals (see ESD for additional details).  $C_m = 2.3 \text{ mg/m}^3$ ; ED = 8 hr/day. Assume 100 sites spray.

NOTE: The respirator class is: III. Combination Gas/Vapor and Particulate (gas and liquid/solid physical forms are both present).

#### INHALATION MONITORING DATA REVIEW

- 1) Uncertainty (estimate based on model, regulatory limit, or data not specific to industry): Yes
  - 2)a) Exposure level > 1 mg/day? Yes
  - OR
  - b) Hazard Rating for health of 2 or greater? 1-2 No
- => Inhalation Monitoring Data Desired? **No**

Exposure to Particulate (volatile) (Class I)

Low End of Range:

- > Potential Dose Rate:  $4.0\text{E}-1 \text{ mg/day}$  over 250 days/yr
- > Lifetime Average Daily Dose:  $2.2\text{E}-3 \text{ mg/kg-day}$  over 250 days/yr
- > Average Daily Dose:  $3.9\text{E}-3 \text{ mg/day}$  over 250 days/yr
- > Acute Potential Dose:  $5.7\text{E}-3 \text{ mg/day}$  over 250 days/yr

High End of Range:

- > Potential Dose Rate:  $2.6\text{E}+0 \text{ mg/day}$  over 250 days/yr
- > Lifetime Average Daily Dose:  $1.5\text{E}-2 \text{ mg/kg-day}$  over 250 days/yr
- > Average Daily Dose:  $2.5\text{E}-2 \text{ mg/day}$  over 250 days/yr
- > Acute Potential Dose:  $3.7\text{E}-2 \text{ mg/day}$  over 250 days/yr

Number of workers (all sites) with inhalation exposure: 3,800

Basis: Roll Coating; EPA/OPPT UV Roll Coating Inhalation Model (non-volatiles); airborne particulate concentration (KcK is based on 8-hour TWA personal monitoring data. Typical  $C_m = 0.04 \text{ mg/m}^3$ ; Worst-case  $C_m = 0.26 \text{ mg/m}^3$ ; ED = 8 hr/day. Assume 200 sites roll coat (submission).

NOTE: The respirator class is: I. Particulate (including solid or liquid droplets).

#### INHALATION MONITORING DATA REVIEW

- 1) Uncertainty (estimate based on model, regulatory limit, or data not specific to industry): Yes

2)a) Exposure level > 1 mg/day? Yes  
OR  
b) Hazard Rating for health of 2 or greater? 1-2 No  
=> Inhalation Monitoring Data Desired? **No**

Dermal:

Note that the ESD specifies dermal exposures from the following activities: (1) Unloading Radiation Curable Formulation; (2) Raw Material Sampling; (3) Cleaning Empty Radiation Curable Component Containers; (4) Application of Radiation Curable Product; and (5) Equipment Cleaning. Dermal exposure estimates are the same for activities #1, 3, and 5 (EPA/OPPT 2-Hand Dermal Contact with Liquid Model). The EPA/OPPT 1-Hand Dermal Contact with Liquid Model is suggested for use to estimate dermal exposure from sampling (2); this scenario does not present this exposure as the EPA/OPPT 2-Hand Dermal Contact with Liquid Model is more conservative and would encompass dermal exposure from this activity. Dermal exposure estimates for the application method (activity #4) are estimated using the EPA/OPPT 2-Hand Dermal Immersion in Liquid Model. This scenario presents two release scenarios for all workers.

Exposure to Liquid at 70.00% concentration

High End:

> Potential Dose Rate: 1.6E+3 mg/day over 250 days/yr  
> Lifetime Average Daily Dose: 8.8E+0 mg/day over 250 days/yr  
> Average Daily Dose: 1.5E+1 mg/day over 250 days/yr  
> Acute Potential Dose: 2.2E+1 mg/day over 250 days/yr  
Number of workers (all sites) with dermal exposure: 300

Basis: Unloading Liquid Raw Material from Drums; EPA/OPPT 2-Hand Dermal Contact with Liquids Model.

Exposure to Liquid at 70.00% concentration

High End:

> Potential Dose Rate: 7.7E+3 mg/day over 250 days/yr  
> Lifetime Average Daily Dose: 4.3E+1 mg/day over 250 days/yr  
> Average Daily Dose: 7.5E+1 mg/day over 250 days/yr  
> Acute Potential Dose: 1.1E+2 mg/day over 250 days/yr  
Number of workers (all sites) with dermal exposure: 1,900

Basis: Spray Coating; EPA/OPPT 2-Hand Dermal Immersion in Liquid Model. For spray application, the EPA/OPPT 2-Hand Dermal Immersion in Liquid Model may be used to estimate dermal exposure to the chemical of interest in a liquid formulation during these application activities.

INITIAL REVIEW ENGINEERING REPORT

PMN: 16-0400

PROC 2: Formulation of Cleaning Fluids (9.5% of Total PV)

Number of Sites/ Location: 5

unknown site(s)

Days/yr: 250

Basis: The submission estimates that 9.5% of the PV will be used in cleaning fluids. Therefore this operation assesses a PV of (63,500,000 kg/yr) x (9.5%) = 6,032,500 kg/yr. // The submission estimates 5% PMN in cleaning fluid, 250 days/yr and up to 5 sites. CS calculates 4,826 kg PMN/site-bt.

Process Description: PMN unloaded from drums (liquid, 100%) into mixing vessel with other cleaning ingredients --> Loading into containers (liquid, 1-5%). (per past case [REDACTED]).

ENVIRONMENTAL RELEASES ESTIMATE SUMMARY

IRER Note: The daily releases listed for any source below may coincide with daily releases from the other sources to the same medium.

Water or Incineration or Landfill

High End:  $3.8\text{E}+1$  kg/site-day over 64 days/yr from 5 sites  
or  $2.4\text{E}+3$  kg/site-yr from 5 sites or  $1.2\text{E}+4$  kg/yr-all sites

to: uncertain

from: Cleaning Liquid Residuals from Tank Trucks Used to Transport the Raw Material

basis: EPA/OPPT Bulk Transport Residual Model, CEB standard 0.2% residual. Submission did not provide information on end use.

Water or Incineration or Landfill

Conservative:  $4.8\text{E}+1$  kg/site-day over 250 days/yr from 5 sites  
or  $1.2\text{E}+4$  kg/site-yr from 5 sites or  $6.0\text{E}+4$  kg/yr-all sites

to: uncertain

from: Equipment Cleaning Losses of Liquids from a Single, Large Vessel

basis: EPA/OPPT Single Vessel Residual Model, CEB standard 1% residual. Submission did not provide information on end use.

Air

Typical:  $8.0\text{E}-3$  kg/site-day over 250 days/yr from 5 sites  
or  $2.0\text{E}+0$  kg/site-yr from 5 sites or  $10.0\text{E}+0$  kg/yr-all sites

Worst Case:  $8.0\text{E}-3$  kg/site-day over 250 days/yr from 5 sites  
or  $2.0\text{E}+0$  kg/site-yr from 5 sites or  $10.0\text{E}+0$  kg/yr-all sites

to: air (model)

from: Unloading Liquid Raw Material from Tank Trucks

basis: EPA/OAQPS AP-42 Loading Model.

Air

Output 2:  $2.9\text{E}-5$  kg/site-day over 250 days/yr from 5 sites  
or  $7.2\text{E}-3$  kg/site-yr from 5 sites or  $3.6\text{E}-2$  kg/yr-all sites

to: air (model)

from: Cleaning Liquid Residuals from Tank Trucks Used to Transport the Raw Material

basis: EPA/OPPT Mass Transfer Coefficient Model.

Air

Output 2:  $2.5\text{E}-2$  kg/site-day over 250 days/yr from 5 sites  
or  $6.3\text{E}+0$  kg/site-yr from 5 sites or  $3.2\text{E}+1$  kg/yr-all sites

to: air (model)

from: Equipment Cleaning Losses of Liquids from a Single, Large Vessel

basis: EPA/OPPT Mass Transfer Coefficient Model.

Air

Typical:  $8.0\text{E}-2$  kg/site-day over 250 days/yr from 5 sites  
or  $2.0\text{E}+1$  kg/site-yr from 5 sites or  $10.0\text{E}+1$  kg/yr-all sites

Worst Case:  $1.6\text{E}-1$  kg/site-day over 250 days/yr from 5 sites



or 4.0E+1 kg/site-yr from 5 sites or 2.0E+2 kg/yr-all sites  
to: air (model)  
from: Loading Liquid Product into Drums  
basis: EPA/OAQPS AP-42 Loading Model.

RELEASE TOTAL  
7.3E+4 kg/yr - all sites

#### OCCUPATIONAL EXPOSURES ESTIMATE SUMMARY

Tot. # of workers exposed via assessed routes: 15

Basis: Submission did not provide information on end use. EPA assesses  
a default minimum of 3 workers/site.

## Inhalation:

Exposure to Vapor (volatile) (Class II)

### Typical:

- > Potential Dose Rate: 3.8E+0 mg/day over 250 days/yr
- > Lifetime Average Daily Dose: 2.1E-2 mg/kg-day over 250 days/yr
- > Average Daily Dose: 3.8E-2 mg/day over 250 days/yr
- > Acute Potential Dose: 5.5E-2 mg/day over 250 days/yr

### Worst Case:

- > Potential Dose Rate: 1.2E+2 mg/day over 250 days/yr
- > Lifetime Average Daily Dose: 6.4E-1 mg/kg-day over 250 days/yr
- > Average Daily Dose: 1.1E+0 mg/day over 250 days/yr
- > Acute Potential Dose: 1.6E+0 mg/day over 250 days/yr

Number of workers (all sites) with inhalation exposure: 15

Basis: Unloading Liquid Raw Material from Tank Trucks; EPA/OPPT Mass Balance Model. Typical: Cm = 24 mg/m<sup>3</sup>; Worst Case: 721 mg/m<sup>3</sup>; ED = 0.13 hr/day.

NOTE: The respirator class is: II. Gas/vapor (all substances in the gas form).

## INHALATION MONITORING DATA REVIEW

- 1) Uncertainty (estimate based on model, regulatory limit, or data not specific to industry): Yes
  - 2)a) Exposure level > 1 mg/day? Yes
  - OR
  - b) Hazard Rating for health of 2 or greater? 1-2 No
- => Inhalation Monitoring Data Desired? **No**

## Dermal:

Exposure to Liquid at 100.00% concentration

### High End:

- > Potential Dose Rate: 2.2E+3 mg/day over 250 days/yr
- > Lifetime Average Daily Dose: 1.3E+1 mg/day over 250 days/yr
- > Average Daily Dose: 2.2E+1 mg/day over 250 days/yr
- > Acute Potential Dose: 3.2E+1 mg/day over 250 days/yr

Number of workers (all sites) with dermal exposure: 15

Basis: Unloading Liquid Raw Material from Tank Trucks; EPA/OPPT 2-Hand Dermal Contact with Liquids Model.

# INITIAL REVIEW ENGINEERING REPORT

PMN: 16-0400

USE 2: Use of Cleaning Fluids (6% of Total PV)

Number of Sites/ Location: 75,600

unknown site(s)

Days/yr: 250

Basis: The submission estimates that 9.5% of the PV will be used in cleaning fluids, and 36.842% (6% of total PV) of that PV will be used by consumers. Therefore this operation assesses a PV of (63,500,000 kg/yr) x (9.5%) x (1-36.842% non-consumer use) = ~3,810,000 kg/yr. // No USE information provided in submission. Submission estimates up to 75,600 sites and 250 days/yr. Past case [REDACTED] (which used data from [REDACTED]), assesses 10 kg cleaner/site-day over 250 day/year as reasonable estimate. EPA assumes 75,600 sites and 250 days/yr to maximize exposures. CS calculates 0.2016 kg PMN/site-bt.

Process Description: Unload PMN from totes, drums, or other packaging containers (liquid, 5%) --> dilute with water (1:1 - 100:1) --> addition of cleaner to surface --> discharged to drain directly or through rinsing of rag, etc (concentration per [REDACTED], process description per past cases [REDACTED]).

## ENVIRONMENTAL RELEASES ESTIMATE SUMMARY

IRER Note: The daily releases listed for any source below may coincide with daily releases from the other sources to the same medium.

Water or Air or Incineration or Landfill

Output 2: 2.0E-1 kg/site-day over 250 days/yr from 75,600 sites  
or 5.0E+1 kg/site-yr from 75,600 sites or 3.8E+6 kg/yr-all sites  
to: uncertain

from: Disposal of Spent Cleaner

basis: User-Defined Loss Rate Model. EPA assumes that product containing PMN is applied to hard surfaces via mops, wipes, etc. and gradually removed with each cleaning of the hard surface. Application and cleaning waste is assumed to be washed directly to drain, rinsed from rags, or rags disposed directly to regular trash and landfilled, with some or all of the PMN volatilizing. EPA assumed 100% release (assuming container volatile releases are negligible compared to the liquid releases) (consistent with [REDACTED]).

Air

Typical: 3.3E-6 kg/site-day over 250 days/yr from 75,600 sites  
or 8.3E-4 kg/site-yr from 75,600 sites or 6.3E+1 kg/yr-all sites  
Worst Case: 6.7E-6 kg/site-day over 250 days/yr from 75,600 sites  
or 1.7E-3 kg/site-yr from 75,600 sites or 1.3E+2 kg/yr-all sites  
to: air (model)

from: Unloading Liquid Raw Material from Drums

basis: EPA/OAQPS AP-42 Loading Model.

RELEASE TOTAL

3.8E+6 kg/yr - all sites

#### OCCUPATIONAL EXPOSURES ESTIMATE SUMMARY

Tot. # of workers exposed via assessed routes: 226,800

Basis: Submission did not provide information on end use. EPA assesses a default minimum of 3 workers/site.

## Inhalation:

Note: Inhalation exposures to chemical vapors during the application process presents a data gap; the PMN is a volatile liquid where the airborne concentration of the chemical of interest is unknown. The inhalation shown below for unloading is only a portion of the total inhalation exposure.

### Exposure to Vapor (volatile) (Class II)

#### Typical:

- > Potential Dose Rate: 1.6E-3 mg/day over 250 days/yr
- > Lifetime Average Daily Dose: 9.0E-6 mg/kg-day over 250 days/yr
- > Average Daily Dose: 1.6E-5 mg/day over 250 days/yr
- > Acute Potential Dose: 2.3E-5 mg/day over 250 days/yr

#### Worst Case:

- > Potential Dose Rate: 9.6E-2 mg/day over 250 days/yr
- > Lifetime Average Daily Dose: 5.4E-4 mg/kg-day over 250 days/yr
- > Average Daily Dose: 9.4E-4 mg/day over 250 days/yr
- > Acute Potential Dose: 1.4E-3 mg/day over 250 days/yr

Number of workers (all sites) with inhalation exposure: 226,800

Basis: Unloading Liquid Raw Material from Drums; EPA/OPPT Mass Balance Model. Typical:  $C_m = 1.3 \text{ mg/m}^3$ ; Worst Case:  $79 \text{ mg/m}^3$ ; ED = 0.001 hr/day.

NOTE: The respirator class is: II. Gas/vapor (all substances in the gas form).

### INHALATION MONITORING DATA REVIEW

- 1) Uncertainty (estimate based on model, regulatory limit, or data not specific to industry): Yes
  - 2)a) Exposure level > 1 mg/day? No
  - OR
  - b) Hazard Rating for health of 2 or greater? 1-2 No
- => Inhalation Monitoring Data Desired? **No**

### Dermal:

#### Exposure to Liquid at 5.00% concentration

##### High End:

- > Potential Dose Rate: 1.1E+2 mg/day over 250 days/yr
- > Lifetime Average Daily Dose: 6.3E-1 mg/day over 250 days/yr
- > Average Daily Dose: 1.1E+0 mg/day over 250 days/yr
- > Acute Potential Dose: 1.6E+0 mg/day over 250 days/yr

Number of workers (all sites) with dermal exposure: 226,800

Basis: Unloading Liquid Raw Material from Drums; EPA/OPPT 2-Hand Dermal Contact with Liquids Model.

# INITIAL REVIEW ENGINEERING REPORT

PMN: 16-0400

PROC 3 and USE 3: Agrochemicals Formulating and Applying (3.2% of Total PV)

Number of Sites/ Location: 1

unknown formulating site(s)

and 1,000 unknown use sites (assume farms with Days/yr = 10)

Days/yr: 250

Basis: The submission estimates that 3.2% of the PV will be used in agrochemicals; therefore this operation assesses a PV of (63,500,000 kg/yr) x (3.2%) = 2,032,000 kg/yr. // Submission estimates 1 site and 250 days/yr. CS calculates 8,128 kg-PMN/day. Past pesticide case [REDACTED] estimated a final PMN concentration (solvent) of 18-45%. [REDACTED] estimated 1 production site, 300 day/yr, for a PV of 15,000,000 kg/yr. For end use, assume 1,000 sites and 10 application days/yr (about 20 drums/site).

Process Description: PMN solvent unloaded from shipping vessel (liquid, 100%) -> Dissolve pesticide or other components in solvent (liquid, 18-45% PMN) (EPA Assessment stops here for FIFRA-approved products; product storage, transport, testing, and use in FIFRA approved pesticide application at other sites) -> loading (assume drums) other non-FIFRA formulations (past case [REDACTED], and assumptions) -> ship to end use sites -> unload drums -> further dilution is possible -> load application equipment -> apply formulation via tractor or spray (assumed process steps)

## ENVIRONMENTAL RELEASES ESTIMATE SUMMARY

IRER Note: The daily releases listed for any source below may coincide with daily releases from the other sources to the same medium ONLY FOR THE SAME NUMBER OF SITES. Combine releases for 1 site and SEPARATELY combine releases for 1,000 sites.

Water or Incineration or Landfill

High End:  $3.8\text{E}+1$  kg/site-day over 107 days/yr from 1 site  
or  $4.0\text{E}+3$  kg/site-yr from 1 site or  $4.0\text{E}+3$  kg/yr-all sites

to: uncertain

from: Cleaning Liquid Residuals from Tank Trucks Used to Transport the Raw Material

basis: EPA/OPPT Bulk Transport Residual Model, CEB standard 0.2% residual. Submission does not provide information on end use.

Water or Incineration or Landfill

Conservative:  $8.1\text{E}+1$  kg/site-day over 250 days/yr from 1 site  
or  $2.0\text{E}+4$  kg/site-yr from 1 site or  $2.0\text{E}+4$  kg/yr-all sites

to: uncertain

from: Equipment Cleaning Losses of Liquids from a Single, Large Vessel

basis: EPA/OPPT Single Vessel Residual Model, CEB standard 1% residual. Submission does not provide information on end use.

Water or Incineration or Landfill

High End:  $5.6\text{E}+0$  kg/site-day over 10 days/yr from 1,000 sites  
or  $5.6\text{E}+1$  kg/site-yr from 1,000 sites or  $5.6\text{E}+4$  kg/yr-all sites

to: uncertain

from: Cleaning Liquid Residuals from Containers Used to Transport the Product

basis: EPA/OPPT Drum Residual Model, CEB standard 3% residual.

Air

Typical:  $1.3\text{E}-2$  kg/site-day over 250 days/yr from 1 site

or  $3.4\text{E}+0$  kg/site-yr from 1 site or  $3.4\text{E}+0$  kg/yr-all sites

Worst Case:  $1.3\text{E}-2$  kg/site-day over 250 days/yr from 1 site

or  $3.4\text{E}+0$  kg/site-yr from 1 site or  $3.4\text{E}+0$  kg/yr-all sites

to: air (model)

from: Unloading Liquid Raw Material from Tank Trucks

basis: EPA/OAQPS AP-42 Loading Model.

Air

Output 2:  $4.9\text{E}-5$  kg/site-day over 250 days/yr from 1 site

or  $1.2\text{E}-2$  kg/site-yr from 1 site or  $1.2\text{E}-2$  kg/yr-all sites

to: air

from: Cleaning Liquid Residuals from Tank Trucks Used to Transport the Raw Material

basis: EPA/OPPT Mass Transfer Coefficient Model.

Air

Output 2:  $2.5\text{E}-2$  kg/site-day over 250 days/yr from 1 site

or  $6.3\text{E}+0$  kg/site-yr from 1 site or  $6.3\text{E}+0$  kg/yr-all sites

to: air

from: Equipment Cleaning Losses of Liquids from a Single, Large Vessel

basis: EPA/OPPT Mass Transfer Coefficient Model.

Air

Typical:  $2.0\text{E}-2$  kg/site-day over 250 days/yr from 1 site

or  $5.1\text{E}+0$  kg/site-yr from 1 site or  $5.1\text{E}+0$  kg/yr-all sites

Worst Case:  $4.1\text{E}-2$  kg/site-day over 250 days/yr from 1 site

or  $1.0\text{E}+1$  kg/site-yr from 1 site or  $1.0\text{E}+1$  kg/yr-all sites

to:

from: Loading Liquid Product into Drums

basis: EPA/OAQPS AP-42 Loading Model.

Air

Typical:  $9.4\text{E}-4$  kg/site-day over 10 days/yr from 1 site

or  $9.4\text{E}-3$  kg/site-yr from 1 site or  $9.4\text{E}-3$  kg/yr-all sites

Worst Case:  $9.4\text{E}-4$  kg/site-day over 10 days/yr from 1 site

or  $9.4\text{E}-3$  kg/site-yr from 1 site or  $9.4\text{E}-3$  kg/yr-all sites

to:

from: Unloading Liquid Product from Drums

basis: EPA/OAQPS AP-42 Loading Model.

Air or Landfill

What-If:  $1.7\text{E}+2$  kg/site-day over 10 days/yr from 1,000 sites

or  $1.7\text{E}+3$  kg/site-yr from 1,000 sites or  $1.7\text{E}+6$  kg/yr-all sites

to: air for volatilized portion, farm land for non-volatilized portion

from: Applying Using Tractor with spray boom

basis: User-Defined Loss Rate Model. Assume  $168$  kg/site-day PMN applicaiton/ use rate at 1,000 farms, 10 application days/yr.

RELEASE TOTAL

$1.8\text{E}+6$  kg/yr - all sites

#### OCCUPATIONAL EXPOSURES ESTIMATE SUMMARY

Tot. # of workers exposed via assessed routes: 1,003

Basis: Submission does not provide information on end use. EPA assumes 3 workers at PROC site and 1 worker/site at 1,000 end use sites.



## Inhalation:

### Exposure to Vapor (volatile) (Class II)

#### Typical:

- > Potential Dose Rate: 6.5E+0 mg/day over 250 days/yr
- > Lifetime Average Daily Dose: 3.6E-2 mg/kg-day over 250 days/yr
- > Average Daily Dose: 6.3E-2 mg/day over 250 days/yr
- > Acute Potential Dose: 9.2E-2 mg/day over 250 days/yr

#### Worst Case:

- > Potential Dose Rate: 1.9E+2 mg/day over 250 days/yr
- > Lifetime Average Daily Dose: 1.1E+0 mg/kg-day over 250 days/yr
- > Average Daily Dose: 1.9E+0 mg/day over 250 days/yr
- > Acute Potential Dose: 2.8E+0 mg/day over 250 days/yr

Number of workers (all sites) with inhalation exposure: 3

Basis: Unloading Liquid Raw Material from Tank Trucks; EPA/OPPT Mass Balance Model. Typical: Cm = 24 mg/m<sup>3</sup>; Worst Case: 721 mg/m<sup>3</sup>; ED = 0.2 hr/day.

NOTE: The respirator class is: II. Gas/vapor (all substances in the gas form).

## INHALATION MONITORING DATA REVIEW

- 1) Uncertainty (estimate based on model, regulatory limit, or data not specific to industry): Yes
  - 2)a) Exposure level > 1 mg/day? Yes
  - OR
  - b) Hazard Rating for health of 2 or greater? 1-2 No
- => Inhalation Monitoring Data Desired? **No**

### Exposure to Vapor (volatile) (Class II)

#### Typical:

- > Potential Dose Rate: 9.8E+0 mg/day over 250 days/yr
- > Lifetime Average Daily Dose: 5.5E-2 mg/kg-day over 250 days/yr
- > Average Daily Dose: 9.6E-2 mg/day over 250 days/yr
- > Acute Potential Dose: 1.4E-1 mg/day over 250 days/yr

#### Worst Case:

- > Potential Dose Rate: 5.9E+2 mg/day over 250 days/yr
- > Lifetime Average Daily Dose: 3.3E+0 mg/kg-day over 250 days/yr
- > Average Daily Dose: 5.8E+0 mg/day over 250 days/yr
- > Acute Potential Dose: 8.4E+0 mg/day over 250 days/yr

Number of workers (all sites) with inhalation exposure: 1

Basis: Loading Liquid Product into Drums; EPA/OPPT Mass Balance Model. Typical: Cm = 1.8 mg/m<sup>3</sup>; Worst Case: Cm = 108 mg/m<sup>3</sup>; ED = 4.3 hr/day.

NOTE: The respirator class is: II. Gas/vapor (all substances in the gas form).

## INHALATION MONITORING DATA REVIEW

- 1) Uncertainty (estimate based on model, regulatory limit, or data not specific to industry): Yes

2)a) Exposure level > 1 mg/day? Yes  
OR  
b) Hazard Rating for health of 2 or greater? 1-2 No  
=> Inhalation Monitoring Data Desired? **No**

Exposure to Vapor (volatile) (Class II)

Typical:

> Potential Dose Rate: 4.5E-1 mg/day over 10 days/yr  
> Lifetime Average Daily Dose: 1.0E-4 mg/kg-day over 10 days/yr  
> Average Daily Dose: 1.8E-4 mg/day over 10 days/yr  
> Acute Potential Dose: 6.5E-3 mg/day over 10 days/yr

Worst Case:

> Potential Dose Rate: 1.4E+1 mg/day over 10 days/yr  
> Lifetime Average Daily Dose: 3.0E-3 mg/kg-day over 10 days/yr  
> Average Daily Dose: 5.3E-3 mg/day over 10 days/yr  
> Acute Potential Dose: 1.9E-1 mg/day over 10 days/yr

Number of workers (all sites) with inhalation exposure: 1,000

Basis: Unloading Liquid Product from Drums; EPA/OPPT Mass Balance Model.  
Typical: Cm = 3.6 mg/m3; Worst Case: Cm = 108 mg/m3; ED = 0.1 hr/day.

NOTE: The respirator class is: II. Gas/vapor (all substances in the gas form).

#### INHALATION MONITORING DATA REVIEW

1) Uncertainty (estimate based on model, regulatory limit, or data not specific to industry): Yes  
2)a) Exposure level > 1 mg/day? Yes  
OR  
b) Hazard Rating for health of 2 or greater? 1-2 No  
=> Inhalation Monitoring Data Desired? **No**

Exposure to Vapor (volatile) (Class II)

What-If:

> Potential Dose Rate: 2.8E+0 mg/day over 10 days/yr  
> Lifetime Average Daily Dose: 6.3E-4 mg/kg-day over 10 days/yr  
> Average Daily Dose: 1.1E-3 mg/day over 10 days/yr  
> Acute Potential Dose: 4.0E-2 mg/day over 10 days/yr

Number of workers (all sites) with inhalation exposure: 1,000

Basis: Applying Using Tractor with spray boom; User-defined Inhalation Model. Analogous use in [REDACTED] mg/m3 (3-hr TWA). Assumptions and input are as follows. Dose rate is estimated as 2.8 mg/day based on pesticide data. The submission estimates a duration of 3 hours/day for liquid spraying. A 1.25 m3/hr breathing rate is assumed, an EPA standard assumption. Therefore, the exposure concentration, as a time-weighted average (TWA) over the duration, in mg/m3 is 2.8 mg/day / 3 hours/day / 1.25 m3/hr = 0.75 mg/m3 (3-hr TWA). Also, EPA assumes for this case 1,000 sites and 10 non-consecutive days/yr.

NOTE: The respirator class is: II. Gas/vapor (all substances in the gas form).

#### INHALATION MONITORING DATA REVIEW

- 1) Uncertainty (estimate based on model, regulatory limit, or data not specific to industry): Yes
- 2)a) Exposure level > 1 mg/day? Yes
- OR
- b) Hazard Rating for health of 2 or greater? 1-2 No
- => Inhalation Monitoring Data Desired? **No**

Dermal:

Exposure to Liquid at 100.00% concentration

High End:

- > Potential Dose Rate: 2.2E+3 mg/day over 250 days/yr
- > Lifetime Average Daily Dose: 1.3E+1 mg/day over 250 days/yr
- > Average Daily Dose: 2.2E+1 mg/day over 250 days/yr
- > Acute Potential Dose: 3.2E+1 mg/day over 250 days/yr

Number of workers (all sites) with dermal exposure: 3

Basis: Unloading Liquid Raw Material from Tank Trucks; EPA/OPPT 2-Hand Dermal Contact with Liquids Model.

Exposure to Liquid at 45.00% concentration

High End:

- > Potential Dose Rate: 1.0E+3 mg/day over 250 days/yr
- > Lifetime Average Daily Dose: 5.7E+0 mg/day over 250 days/yr
- > Average Daily Dose: 9.9E+0 mg/day over 250 days/yr
- > Acute Potential Dose: 1.4E+1 mg/day over 250 days/yr

Number of workers (all sites) with dermal exposure: 1

Basis: Loading Liquid Product into Drums; EPA/OPPT 2-Hand Dermal Contact with Liquids Model.

Exposure to Liquid at 45.00% concentration

High End:

- > Potential Dose Rate: 1.0E+3 mg/day over 10 days/yr
- > Lifetime Average Daily Dose: 2.3E-1 mg/day over 10 days/yr
- > Average Daily Dose: 4.0E-1 mg/day over 10 days/yr
- > Acute Potential Dose: 1.4E+1 mg/day over 10 days/yr

Number of workers (all sites) with dermal exposure: 1

Basis: Unloading Liquid Product from Drums; EPA/OPPT 2-Hand Dermal Contact with Liquids Model.

INITIAL REVIEW ENGINEERING REPORT

PMN: 16-0400

PROC 4: Formulation of MW Fluids (8.9% of Total PV)

Number of Sites/ Location: 300

unknown site(s)

Days/yr: 250

Basis: The submission estimates that 8.9% of the PV will be used in metalworking fluids; therefore this operation assesses a PV of (63,500,000 kg/yr) x (8.9%) = 5,651,500 kg/yr. // The submission estimates up to 300 sites for processing of MW fluid. Past case

. EPA assumes 300 sites and 250 days/yr. CS calculates 75.3533 kg PMN/site-bt.

Process Description: PMN (liquid, 100%) charged to mixing vessel --> PMN combined with other ingredients --> PMN packaged (liquid, 35%) (process per engineering judgment; PMN concentration based on Use of MW fluids ESD default)

ENVIRONMENTAL RELEASES ESTIMATE SUMMARY

IRER Note: The daily releases listed for any source below may coincide with daily releases from the other sources to the same medium.

Water or Incineration or Landfill

High End:  $3.8\text{E}+1$  kg/site-day over 1 day/yr from 300 sites  
or  $3.8\text{E}+1$  kg/site-yr from 300 sites or  $1.1\text{E}+4$  kg/yr-all sites  
to: uncertain

from: Cleaning Liquid Residuals from Tank Trucks Used to Transport the Raw Material

basis: EPA/OPPT Bulk Transport Residual Model, CEB standard 0.2% residual. The submission does not provide information on end use.

Water or Incineration or Landfill

Conservative:  $7.5\text{E}-1$  kg/site-day over 250 days/yr from 300 sites  
or  $1.9\text{E}+2$  kg/site-yr from 300 sites or  $5.7\text{E}+4$  kg/yr-all sites  
to: uncertain

from: Equipment Cleaning Losses of Liquids from a Single, Large Vessel

basis: EPA/OPPT Single Vessel Residual Model, CEB standard 1% residual. The submission does not provide information on end use.

Air

Typical:  $1.2\text{E}-4$  kg/site-day over 250 days/yr from 300 sites  
or  $3.1\text{E}-2$  kg/site-yr from 300 sites or  $9.4\text{E}+0$  kg/yr-all sites  
Worst Case:  $1.2\text{E}-4$  kg/site-day over 250 days/yr from 300 sites  
or  $3.1\text{E}-2$  kg/site-yr from 300 sites or  $9.4\text{E}+0$  kg/yr-all sites  
to: air (model)

from: Unloading Liquid Raw Material from Tank Trucks

basis: EPA/OAQPS AP-42 Loading Model.

Air

Output 2:  $4.5\text{E}-7$  kg/site-day over 250 days/yr from 300 sites  
or  $1.1\text{E}-4$  kg/site-yr from 300 sites or  $3.4\text{E}-2$  kg/yr-all sites  
to: air (model)

from: Cleaning Liquid Residuals from Tank Trucks Used to Transport the Raw Material

basis: EPA/OPPT Mass Transfer Coefficient Model.

Air

Output 2:  $2.5\text{E}-2$  kg/site-day over 250 days/yr from 300 sites  
or  $6.3\text{E}+0$  kg/site-yr from 300 sites or  $1.9\text{E}+3$  kg/yr-all sites  
to: air (model)

from: Equipment Cleaning Losses of Liquids from a Single, Large Vessel

basis: EPA/OPPT Mass Transfer Coefficient Model.

Air

Typical:  $1.8\text{E}-4$  kg/site-day over 250 days/yr from 300 sites  
or  $4.5\text{E}-2$  kg/site-yr from 300 sites or  $1.3\text{E}+1$  kg/yr-all sites  
Worst Case:  $3.6\text{E}-4$  kg/site-day over 250 days/yr from 300 sites

or 8.9E-2 kg/site-yr from 300 sites or 2.7E+1 kg/yr-all sites  
to: air (model)  
from: Loading Liquid Product into Drums  
basis: EPA/OAQPS AP-42 Loading Model.

RELEASE TOTAL  
7.0E+4 kg/yr - all sites

#### OCCUPATIONAL EXPOSURES ESTIMATE SUMMARY

Tot. # of workers exposed via assessed routes: 900

Basis: The submission does not provide information on end use. EPA assesses a default minimum of 3 workers/site.

## Inhalation:

Exposure to Vapor (volatile) (Class II)

### Typical:

- > Potential Dose Rate:  $6.0\text{E-}2$  mg/day over 250 days/yr
- > Lifetime Average Daily Dose:  $3.3\text{E-}4$  mg/kg-day over 250 days/yr
- > Average Daily Dose:  $5.9\text{E-}4$  mg/day over 250 days/yr
- > Acute Potential Dose:  $8.6\text{E-}4$  mg/day over 250 days/yr

### Worst Case:

- > Potential Dose Rate:  $1.8\text{E+}0$  mg/day over 250 days/yr
- > Lifetime Average Daily Dose:  $1.0\text{E-}2$  mg/kg-day over 250 days/yr
- > Average Daily Dose:  $1.8\text{E-}2$  mg/day over 250 days/yr
- > Acute Potential Dose:  $2.6\text{E-}2$  mg/day over 250 days/yr

Number of workers (all sites) with inhalation exposure: 900

Basis: Unloading Liquid Raw Material from Tank Trucks; EPA/OPPT Mass Balance Model. Typical:  $C_m = 24$  mg/m<sup>3</sup>; Worst Case:  $C_m = 721$  mg/m<sup>3</sup>; ED = 0.002 hr/day.

NOTE: The respirator class is: II. Gas/vapor (all substances in the gas form).

## INHALATION MONITORING DATA REVIEW

- 1) Uncertainty (estimate based on model, regulatory limit, or data not specific to industry): Yes
  - 2)a) Exposure level > 1 mg/day? Yes
  - OR
  - b) Hazard Rating for health of 2 or greater? 1-2 No
- => Inhalation Monitoring Data Desired? **No**

## Dermal:

Exposure to Liquid at 100.00% concentration

### High End:

- > Potential Dose Rate:  $2.2\text{E+}3$  mg/day over 250 days/yr
- > Lifetime Average Daily Dose:  $1.3\text{E+}1$  mg/day over 250 days/yr
- > Average Daily Dose:  $2.2\text{E+}1$  mg/day over 250 days/yr
- > Acute Potential Dose:  $3.2\text{E+}1$  mg/day over 250 days/yr

Number of workers (all sites) with dermal exposure: 900

Basis: Unloading Liquid Raw Material from Tank Trucks; EPA/OPPT 2-Hand Dermal Contact with Liquids Model.

# INITIAL REVIEW ENGINEERING REPORT

PMN: 16-0400

USE 4: Use of Metalworking Fluid (8.9% of Total PV)

Number of Sites/ Location: 14,000

unknown site(s)

Days/yr: 247

Basis: The submission estimates that 8.9% of the PV will be used in metalworking fluids; therefore this operation assesses a PV of (63,500,000 kg/yr) x (8.9%) = 5,651,500 kg/yr. // The July 2011 Emission Scenario Document (ESD) on the Use of Metalworking Fluids (MWF) provides default values of 247 operating days/yr; 35% PMN in raw material; 3.5% PMN in the trough; and MWF use rate of 11.42 kg/site-day for an unknown MWF chemical where both occupational exposures or environmental releases are a concern (see ESD for additional details). The submission estimates up to 14,000 sites. EPA assumes 14,000 sites and 247 days/yr to maximize exposures. CS calculates 1.6343 kg PMN/site-bt.

Process Description: Neat metalworking fluid (MWF) (liquid, 35% - default, unknown fluid type) is unloaded from containers and transferred to the metal shaping machine trough with other metalworking fluids and/or water (liquid, 3.5% - default, unknown fluid type) --> Fluids are used in the metal shaping machine and recycled back to the trough (spent fluids are disposed) --> Fluids remaining on metal parts are rinsed and dried (per ESD).

## ENVIRONMENTAL RELEASES ESTIMATE SUMMARY

IRER Note: The daily releases listed for any source below may coincide with daily releases from the other sources to the same medium.



Water

ESD est: 1.7E-1 kg/site-day over 247 days/yr from 14,000 sites  
or 4.3E+1 kg/site-yr from 14,000 sites or 6.0E+5 kg/yr-all sites  
to: water (on-site treatment or POTW) (per ESD)

from: Dragout Losses

basis: User-Defined Loss Rate Model. Per the ESD, metalworking fluid remains on the part after shaping and is typically removed during an intermediate washing step. The amount released to water is estimated using the following loss fraction (LF) = (1- Container Residue LF) x Fraction of chemical lost from dragout = (1-0.03) x 0.11 (default) = 0.1067.

Water or Incineration

ESD est: 8.4E-1 kg/site-day over 247 days/yr from 14,000 sites  
or 2.1E+2 kg/site-yr from 14,000 sites or 2.9E+6 kg/yr-all sites  
to: on-site treatment or POTW (water-based) or incineration (straight oil) (per ESD)

from: Spent Metalworking Fluid

basis: User-Defined Loss Rate Model. Per the ESD, the MW fluid will eventually degrade or spoil and be disposed. The default media of release for spent metalworking fluids is discharge to POTW for water-based metalworking fluids and incineration for straight oils. The amount released is estimated using the following loss fraction (LF) = (1- Container Residue LF) x (1 - Fraction of chemical lost during dragout - Fraction of chemical lost during filtration and other recycling operations) = (1 - 0.03) x (1 - 0.11 - 0.36) = 0.5141.

Water or Incineration or Landfill

High End: 2.2E+0 kg/site-day over 6 days/yr from 14,000 sites  
or 1.3E+1 kg/site-yr from 14,000 sites or 1.8E+5 kg/yr-all sites  
to: water, incineration, or landfill (per ESD)

from: Cleaning Liquid Residuals from Drums Used to Transport the Raw Material

basis: EPA/OPPT Drum Residual Model, CEB standard 3% residual. The ESD indicates that metalworking fluids can be transported in containers of various sizes. The default transportation container size of a 55-gallon drum should be used in the absence of site-specific information. The media of release for container residues from metal shaping operations is not known; therefore, the entire release from container residue is assessed to each of water, incineration, or landfill by default.

Water or Incineration or Landfill

ESD est: 5.7E-1 kg/site-day over 247 days/yr from 14,000 sites  
or 1.4E+2 kg/site-yr from 14,000 sites or 2.0E+6 kg/yr-all sites  
to: water, incineration, or landfill (water-based metalworking fluids);  
incineration or landfill (straight oils) (per ESD)

from: Filter Media and Other Recycling Wastes

basis: User-Defined Loss Rate Model. Per the ESD, the metalworking fluid becomes contaminated with tramp oils and metal fines during use. Filtering and recycling operations can be used to extend the fluid life, which results in a percentage of lost MW fluid. The media of release for these wastes varies by site. Per the ESD, the default media of release for filtration and recycling wastes should be water, incineration, or landfill for water-based metalworking fluids and incineration or landfill for straight oils. The amount released to uncertain media is estimated using the following loss fraction (LF) = (1- Container Residue LF) x Fraction of chemical lost during filtration and other recycling operations = (1-0.03) x 0.36 (default) = 0.3492.

Air

Typical: 3.9E-6 kg/site-day over 247 days/yr from 14,000 sites  
or 9.6E-4 kg/site-yr from 14,000 sites or 1.3E+1 kg/yr-all sites  
Worst Case: 7.7E-6 kg/site-day over 247 days/yr from 14,000 sites  
or 1.9E-3 kg/site-yr from 14,000 sites or 2.7E+1 kg/yr-all sites  
to: air (model)

from: Unloading Liquid Raw Material from Drums

basis: EPA/OAQPS AP-42 Loading Model.

Air

Output 2: 1.2E-7 kg/site-day over 247 days/yr from 14,000 sites  
or 2.9E-5 kg/site-yr from 14,000 sites or 4.1E-1 kg/yr-all sites  
to: air (model)

from: Cleaning Liquid Residuals from Drums Used to Transport the Raw Material

basis: EPA/OPPT Mass Transfer Coefficient Model.

RELEASE TOTAL

5.7E+6 kg/yr - all sites

#### OCCUPATIONAL EXPOSURES ESTIMATE SUMMARY

Tot. # of workers exposed via assessed routes: 672,000

Basis: The ESD on the Use of Metalworking Fluids estimates a default of 48 workers per site may potentially be exposed to the chemical of interest. Some facilities may also have assembly workers and on-site waste treatment operators, although they would not typically be exposed to metalworking fluids. Large shops may have many more exposed employees.

## Inhalation:

Note: Inhalation exposures to chemical vapors during this use presents a data gap; the PMN is a volatile liquid where the airborne concentration of the chemical of interest is unknown. The inhalation shown below for unloading and for mist are only a portion of the total inhalation exposures.

### Exposure to Vapor (volatile) (Class II)

#### Typical:

- > Potential Dose Rate: 1.9E-3 mg/day over 247 days/yr
- > Lifetime Average Daily Dose: 1.0E-5 mg/kg-day over 247 days/yr
- > Average Daily Dose: 1.8E-5 mg/day over 247 days/yr
- > Acute Potential Dose: 2.7E-5 mg/day over 247 days/yr

#### Worst Case:

- > Potential Dose Rate: 1.1E-1 mg/day over 247 days/yr
- > Lifetime Average Daily Dose: 6.1E-4 mg/kg-day over 247 days/yr
- > Average Daily Dose: 1.1E-3 mg/day over 247 days/yr
- > Acute Potential Dose: 1.6E-3 mg/day over 247 days/yr

Number of workers (all sites) with inhalation exposure: 672,000

Basis: Unloading Liquid Raw Material from Drums; EPA/OPPT Mass Balance Model. Typical:  $C_m = 1.3 \text{ mg/m}^3$ ; Worst Case:  $79 \text{ mg/m}^3$ ; ED = 0.001 hr/day.

NOTE: The respirator class is: II. Gas/vapor (all substances in the gas form).

### INHALATION MONITORING DATA REVIEW

- 1) Uncertainty (estimate based on model, regulatory limit, or data not specific to industry): Yes
  - 2)a) Exposure level > 1 mg/day? No
  - OR
  - b) Hazard Rating for health of 2 or greater? 1-2 No
- => Inhalation Monitoring Data Desired? **No**

### Exposure to Mist (volatile) (Class III)

#### Typical:

- > Potential Dose Rate: 2.1E+0 mg/day over 247 days/yr
- > Lifetime Average Daily Dose: 1.2E-2 mg/kg-day over 247 days/yr
- > Average Daily Dose: 2.0E-2 mg/day over 247 days/yr
- > Acute Potential Dose: 3.0E-2 mg/day over 247 days/yr

#### High End:

- > Potential Dose Rate: 9.6E+0 mg/day over 247 days/yr
- > Lifetime Average Daily Dose: 5.3E-2 mg/kg-day over 247 days/yr
- > Average Daily Dose: 9.3E-2 mg/day over 247 days/yr
- > Acute Potential Dose: 1.4E-1 mg/day over 247 days/yr

Number of workers (all sites) with inhalation exposure: 672,000

Basis: Metal Shaping Operations; User-defined Inhalation Model. The workers operating metal shaping equipment are potentially exposed to the metalworking fluid by the mist that is generated from the shaping machine. Metal shaping machines typically spray the metalworking fluid on the part in the cutting zone, resulting in the generation of mist. For an unknown MW fluid, the typical mist concentration is estimated to be 0.24 mg/m<sup>3</sup>, while the high-end mist concentration is estimated to be 1.10 mg/m<sup>3</sup>. Fraction of chemical in the mist is estimated to be  $F_{chem\_neat} / (1 - F_{water\_neat}) = 0.35 / (1 - 0.6) = 0.875$ . Inhalation exposure = MW fluid mist concentration x Breathing Rate x Exposure time (hr) x Fraction of chemical in the mist = (0.24 to 1.10 mg/m<sup>3</sup>) x (1.25 m<sup>3</sup>/hr) x (8 hr/day) x 0.875 = 2.1 to 9.625 mg/day. The ESD indicates that machine workers will perform this activity; therefore, the number of workers for this activity is 46 workers per site. Typ Cm = 0.21 mg/m<sup>3</sup>, High-end Cm = 0.96 mg/m<sup>3</sup>; ED = 8 hr/day.

NOTE: The respirator class is: III. Combination Gas/Vapor and Particulate (gas and liquid/solid physical forms are both present).

#### INHALATION MONITORING DATA REVIEW

- 1) Uncertainty (estimate based on model, regulatory limit, or data not specific to industry): Yes
  - 2)a) Exposure level > 1 mg/day? Yes
  - OR
  - b) Hazard Rating for health of 2 or greater? 1-2 No
- => Inhalation Monitoring Data Desired? **No**

#### Dermal:

Note that the ESD specifies dermal exposures from various activities (see ESD for additional information). As a conservative estimate, workers were assumed to be exposed during the activity with the highest concentration of PMN (transport container unloading).

Exposure to Liquid at 35.00% concentration

Typical:

- > Potential Dose Rate: 2.6E+2 mg/day over 247 days/yr
- > Lifetime Average Daily Dose: 1.4E+0 mg/day over 247 days/yr
- > Average Daily Dose: 2.5E+0 mg/day over 247 days/yr
- > Acute Potential Dose: 3.7E+0 mg/day over 247 days/yr

Number of workers (all sites) with dermal exposure: 672,000

Basis: Unloading Liquid Raw Material from Drums; EPA/OPPT 2-Hand Dermal Contact with Liquids Model. Per the ESD, at most sites, a limited number of workers are responsible for handling the neat metalworking fluid; however, at some small sites the individual machine operators may add neat metalworking fluid to their machines. The number of workers for this activity ranges from 2 shift workers (typical) to 46 machinists (high-end).

INITIAL REVIEW ENGINEERING REPORT

PMN: 16-0400

PROC/USE 5: Chemical Intermediate (53.4% of Total PV)

Number of Sites/ Location: 16

unknown site(s)

Days/yr: 250

Basis: Submission estimates 16 sites, 250 days/yr and 20,000 kg/site-day. EPA assumes 16 sites and 250 days/yr. CS calculates 8,477.25 kg PMN/site-bt.

Process Description: PMN (liquid, 100%) unloaded from shipping vessels --> PMN charged to reaction vessel --> PMN combined with other chemicals and destroyed (per engineering judgment and past cases).

ENVIRONMENTAL RELEASES ESTIMATE SUMMARY

IRER Note: The daily releases listed for any source below may coincide with daily releases from the other sources to the same medium.

Water or Incineration or Landfill

High End:  $3.8\text{E}+1$  kg/site-day over 112 days/yr from 16 sites

or  $4.2\text{E}+3$  kg/site-yr from 16 sites or  $6.8\text{E}+4$  kg/yr-all sites

to: uncertain

from: Cleaning Liquid Residuals from Tank Trucks Used to Transport the Raw Material

basis: EPA/OPPT Bulk Transport Residual Model, CEB standard 0.2% residual. The submission does not provide information on end use.

Water or Incineration or Landfill

Output 1:  $8.5\text{E}-1$  kg/site-day over 250 days/yr from 16 sites

or  $2.1\text{E}+2$  kg/site-yr from 16 sites or  $3.4\text{E}+3$  kg/yr-all sites

Output 2:  $4.2\text{E}+0$  kg/site-day over 250 days/yr from 16 sites

or  $1.1\text{E}+3$  kg/site-yr from 16 sites or  $1.7\text{E}+4$  kg/yr-all sites

to: uncertain

from: Equipment Cleaning Losses of Liquids from a Single, Large Vessel

basis: User-Defined Loss Rate Model. Submission does not provide end use information. Per March 2015 guidance on assessing releases of a chemical intermediate from reactor cleaning, EPA assumes 95 - 99% reaction, with 1% residual. Therefore,  $LF = (1 - 0.95 \text{ to } 0.99) \times 0.01 = 0.0001 \text{ to } 0.0005$ .

Air

Typical:  $1.4\text{E}-2$  kg/site-day over 250 days/yr from 16 sites

or  $3.5\text{E}+0$  kg/site-yr from 16 sites or  $5.6\text{E}+1$  kg/yr-all sites

Worst Case:  $1.4\text{E}-2$  kg/site-day over 250 days/yr from 16 sites

or  $3.5\text{E}+0$  kg/site-yr from 16 sites or  $5.6\text{E}+1$  kg/yr-all sites

to: air (model)

from: Unloading Liquid Raw Material from Tank Trucks

basis: EPA/OAQPS AP-42 Loading Model.

Air

Output 2:  $5.1\text{E}-5$  kg/site-day over 250 days/yr from 16 sites

or  $1.3\text{E}-2$  kg/site-yr from 16 sites or  $2.0\text{E}-1$  kg/yr-all sites

to: air (model)

from: Cleaning Liquid Residuals from Tank Trucks Used to Transport the Raw Material

basis: EPA/OPPT Mass Transfer Coefficient Model.

Air

Output 2:  $3.2\text{E}-2$  kg/site-day over 250 days/yr from 16 sites

or  $7.9\text{E}+0$  kg/site-yr from 16 sites or  $1.3\text{E}+2$  kg/yr-all sites

to: air (model)

from: Equipment Cleaning Losses of Liquids from a Single, Large Vessel

basis: EPA/OPPT Mass Transfer Coefficient Model.

RELEASE TOTAL  
8.5E+4 kg/yr - all sites

OCCUPATIONAL EXPOSURES ESTIMATE SUMMARY

Tot. # of workers exposed via assessed routes: 48

Basis: The submission does not provide information on end use. EPA assumes a default minimum of 3 workers/site.



## Inhalation:

Exposure to Vapor (volatile) (Class II)

### Typical:

- > Potential Dose Rate: 6.7E+0 mg/day over 250 days/yr
- > Lifetime Average Daily Dose: 3.8E-2 mg/kg-day over 250 days/yr
- > Average Daily Dose: 6.6E-2 mg/day over 250 days/yr
- > Acute Potential Dose: 9.6E-2 mg/day over 250 days/yr

### Worst Case:

- > Potential Dose Rate: 2.0E+2 mg/day over 250 days/yr
- > Lifetime Average Daily Dose: 1.1E+0 mg/kg-day over 250 days/yr
- > Average Daily Dose: 2.0E+0 mg/day over 250 days/yr
- > Acute Potential Dose: 2.9E+0 mg/day over 250 days/yr

Number of workers (all sites) with inhalation exposure: 48

Basis: Unloading Liquid Raw Material from Tank Trucks; EPA/OPPT Mass Balance Model. Typical: Cm = 24.05828 mg/m<sup>3</sup>; ED = 0.2239696 hr/day. Worst Case: 721.7483 mg/m<sup>3</sup> ED = 0.2239696 hr/day.

NOTE: The respirator class is: II. Gas/vapor (all substances in the gas form).

## INHALATION MONITORING DATA REVIEW

- 1) Uncertainty (estimate based on model, regulatory limit, or data not specific to industry): Yes
  - 2)a) Exposure level > 1 mg/day? Yes
  - OR
  - b) Hazard Rating for health of 2 or greater? 1-2 No
- => Inhalation Monitoring Data Desired? **No**

## Dermal:

Exposure to Liquid at 100.00% concentration

### High End:

- > Potential Dose Rate: 2.2E+3 mg/day over 250 days/yr
- > Lifetime Average Daily Dose: 1.3E+1 mg/day over 250 days/yr
- > Average Daily Dose: 2.2E+1 mg/day over 250 days/yr
- > Acute Potential Dose: 3.2E+1 mg/day over 250 days/yr

Number of workers (all sites) with dermal exposure: 48

Basis: Unloading Liquid Raw Material from Tank Trucks; EPA/OPPT 2-Hand Dermal Contact with Liquids Model.